left the influence of friction to be found from observations. Erman deduces this latter influence analytically.

THE DAILY WEATHER MAP FOR MEXICO.

A great addition has lately been made to our knowledge of the meteorology of North America by the publication of the daily weather map for the Republic of Mexico, the issue of which began March 1, 1899. The map is about 12 inches high by 16 broad, and enables one to make immediate connection with the daily map of the United States and Canada. The observations are made simultaneously at 8 a. m., on the seventy-fifth meridian or 6:23 a. m., local mean time of the City of Mexico. Barometric pressures are reduced to sea level, but apparently not to standard gravity. The temperatures are surface observations and not reduced to sea level. The metric system is used. The observations are made by the officials of the federal telegraph system, whose director general, Senor Chaves, with the assistance of Senator Bárcena has finally succeeded in accomplishing this great work under the general direction of the Secretary of the Department of Roads and Public Works. A sample map is reproduced on Chart XI of the present REVIEW. The reader will easily convert the isobars and isotherms into English equivalents by the following small table:

Pressure.		Temperature.	
Millimeters.	Inches.	C.	F.
		°	°
740.0	29.13	—40	— 40
742.5	29.23	—35	— 31
745.0	29.33	—30	— 22
747.5	29.43	—25	— 13
750.0	29.53	—20	— 4
752.5	29.63	—15	+ 5
755.0	29.72	—10	+ 14
757.5	29.82	— 5	+ 23
760.0	29.92	0	+ 32
762.5	30.02	+ 5	+ 41
765.0	30.12	+10	+ 50
767.5	30.22	+15	+ 59
770.0	30.32	+20	+ 68
772.5	30.41	+25	+ 77
775.0	30.51	+30	+ 86
777.5	30.61	+35	+ 95
780.0	30.71	+40	+104
782.5	30.81		
785.0	30.90		

This map appears as an annex to the Boletin Telegrafico, published by the Department of Federal Telegraphs. The first number of the Boletin and map is dated March 1. The text of the Boletin seems to be confined to statistical data, relative to imports and exports, but we copy the following remarks from the first number.

THE UTILITY OF THE WEATHER MAP.

(Translated from the Boletin Telegrafico of March 1, 1899.)

The meteorological phenomena of any locality are not isolated and independent; they are not even complete phenomena but are parts of one that started far away, and which, in its subsequent development, assumed various aspects and traversed hundreds and thousands of kilometers. A single city or a limited region sees only one phase of the whole phenomenon.

Hence the necessity for comparing the meteorological records collected in various localities. In order to obtain such data, the Central Meteorological Observatory requested from the telegraph companies of the federal system, simultaneous observations of weather conditions.

These observations were, however, deficient and imperfect, and of very little use to the Observatory on account of the inaccuracy which such observations necessarily possess when based upon the appreciation of each individual and not upon the readings of appropriate instruments.

The Director of the Federal Telegraphs desirous, through his service, of assisting the Observatory with more accurate and incomparably more useful records, distributed among 35 telegraph offices the instruments necessary for obtaining the data relative to pressure, temperature, humidity of the air, direction and force of the wind, taking care that these 35 offices should be at appropriate distances one from the other and properly distributed throughout the vast territory of the Republic. We should also state that in addition to the 35 federal stations four other private stations have also given us their cooperation; their assistance is much appreciated and gratefully acknowledged by the Director and their work will receive the publicity it merits.

The weather map, which is published in the Republic for the first time to-day, shows the weather conditions *at the same moment over the whole country*.

For the past six months, the observations, as recorded by the instruments, have been transmitted every day by telegraph, and the Central Office reduces and computes them by means of numerical tables properly prepared, in order to trace the curves of full and dotted lines, which show on the map the points all over the country where the pressures and temperatures respectively are the same. The pressures are drawn for every 2½ millimeters, and the temperatures for every 5 degrees. Of course, the regions between two isobars and two consecutive isotherms are comprised between the numbers represented by the said lines.

These lines are continuations of those of the United States and can be followed on the maps of that country. It was in order to form as it were one service that the Government of Mexico organized its own service on the same system as that adopted in the United States, and both countries make a daily exchange of their respective observations.

As regards the public, the principal object of a meteorological service like the one inaugurated to-day, is the prediction of the weather; such predictions are not possible except with a very long series of observations, and by taking all the precautions which the complexity of the atmospheric phenomena demand. These phenomena are the more complex in proportion as the region where they are observed is exceptional, as is the case in our country.

The record above referred to will aid the telegraph service in making more accurate predictions than it has yet ventured on, if only for the purpose of warning the inspectors of the damage likely to be done along the line of danger, and by causing the officials charged with the care of the lines, to take the necessary precautions in time, in order to foresee or to repair the damage often done by thunderstorms, particularly along the coast. Such precautions were adopted with good results on the occasion of the last thunderstorm.

Besides this, the telegraph service also derives from the simultaneous meteorological service, extending over large sections of country, the great advantage of acquiring a better knowledge of the conductibility and insulation of the telegraph wires. All of these direct benefits to the telegraph service contribute indirectly to the public good by conducing to a better telegraphic service than exists at present. In addition to this, there is also a great and direct advantage to be derived by the agriculturist, navigator, or who would undertake to collect, study, and analyze the maps and make his own predictions. Be this, however, as it may, the essential feature is in the official meteorological service itself, which affords the basis for the prediction of the weather. Such predictions will also be attained in the course of time.

JOHN H. HARMON.

Announcement is made of the death at Washington, D. C., on March 29, 1899, of Mr. John H. Harmon, of the Central

Office. Mr. Harmon was born in Detroit, Mich., in 1860, received his education in the common schools, and at the Michigan Agricultural College, and had taken a two years' course in the law school of the Columbian University at Washington.

He enlisted in the Signal Corps in September, 1879, and with the exception of about a year served continuously in that corps and after 1891 in the Weather Bureau until his death. He was stationed at Louisville, Minneapolis, Columbia, S. C., and at the Central Office. Mr. Harmon was a man of most kindly and genial disposition and a faithful and efficient observer and clerk.—*H. E. Williams.*

OBSCURE POINTS IN METEOROLOGY.

In a recent publication by the director of the Hongkong Observatory on The Law of Storms in the Eastern Seas there occur paragraphs that have caused some misapprehension and may need a word of comment in order to set the matter right in the minds of our readers. The following extracts are reprinted as preliminary to our comments. Speaking of typhoons in the eastern seas, Dr. Doberck, on page 3, says:

When the trough [A] of low pressure stretches from the south of Hainan through the Bashee Channel right out into the Pacific to the south of Japan and the northeast and southwest winds on either side of it are fresh or strong, the conditions have often been mistaken for two typhoons, one in the China Sea and one to the south of Japan, before ever any typhoon was formed.

The heavy rain is, of course, not the cause of the phenomena, for the rain itself is caused by the air rising in the axis of these depressions, also the water vapor condensing gives out heat, and thus, in the first instance, makes the mercury rise in the barometer before a squall; but there can not be any doubt that the quantity of water vapor condensed to form perhaps 10 inches of rain per day, and whose pressure is thus abstracted from the barometric pressure of the air, causes [B] the permanency of the depressions. It is different with the rainfall in the southwest monsoon. That is spread over a large area and does not give rise to a low pressure in one spot surrounded by higher pressures.

On page 7 he says:

When the wind rises in a typhoon it blows in gusts and the mercury heaves in the barometer. When the wind has reached force 11 it blows in fierce squalls of something about ten minutes' duration, while the mercury heaves up and down as much as a tenth of an inch. The mercury often gives a jump upward as the wind begins to veer in a squall. Then it drops down and gives another upward jump as the wind comes back to nearly its old direction. During these squalls an enormous quantity of rain falls in a few minutes. The temperature falls and rises a fraction of a degree or more. The wind does not return to quite the former direction, except just in front of the center. At the time when the center is nearest, a fierce squall is usually felt, and in that squall the direction of the wind changes considerably and the barometer begins to rise. The squalls appear to be caused by an up [C] and down movement of the air. As the air comes rushing down, the raindrops evaporate in the hotter stratum near the earth's surface, and, owing to the increased tension of water vapor, the barometer (after a fall caused by the cold of evaporation) begins to rise. The wind veers [D] toward the direction of the wind above, which latter is known from the motion of the clouds. Then the air starts to rise with a deluge of rain, caused by the condensation of vapor arriving at the cooler stratum above, while the barometer (after a rise caused [E] by the heat of condensation) drops down, owing to the cessation of the pressure of water vapor condensed into the rain fallen, and the wind resumes the direction determined by the central depression, for the latter is so great in a typhoon and gradients so steep near the center that subsidiary depressions have never occurred in the China Sea.

On page 11 Doberck says:

The wind blows from a region where the air pressure is higher toward one where it is lower. It is, however, deflected toward the right in the northern hemisphere. The force of the wind depends upon the difference of pressure between one place and another situated in the direction where the barometric slope or gradient is greatest. The gradient is measured in hundredths of an inch per 15 nautical miles. The force of the wind corresponding to a certain gradient is greater the hotter the air is, and is different in a typhoon from what it is in the trade, owing to the path of the air particles being curved. * * * [F]

The steepest gradient (1 inch in 15 miles) ever met with occurred in a low latitude in the Pacific. That corresponds to a wind velocity of perhaps about 160 miles per hour at sea level. Such velocities are not uncommon at an altitude of 2,000 feet in severe typhoons. [G] Anything above 80 miles per hour is called a typhoon. It is seen that there is as great a difference between the force of one typhoon and another as between a calm and a storm which nearly reaches typhoon force.

When a typhoon is blowing it is of great importance to have a house well shut up. Windows and doors should be firmly locked, bolted and barred. Damage is frequently caused by shutters being out of repair. Once the wind enters a broken window, it begins to blow through and its force is then quickly felt. As long as all apertures are thoroughly shut on both sides a fearful howling and whistling is heard, the rain blows in through the smallest openings and the house may shake but damage is seldom done. Should a fierce squall get the chance to blow into a house, the roof is often the first part to give way. It is believed that pressure falls so quickly outside that the air confined in the house [H] bursts through the roof like an explosion, but there is no foundation for that belief; it is more likely that a fierce squall would break through the windows and doors, and through the roof as well. But if any fear is entertained of the air being confined inside, it is merely necessary to leave the chimneys open so that pressure inside [I] will be nearly the same as on the outside.

In many typhoons the barometer, reduced to the temperature of freezing water and to sea level, does not fall below 28.80 inches. In others it falls as low as 28.50. Lower readings are rare, but sometimes it falls much lower.

No typhoon ever stands still. As soon as it is formed, it is carried forward by the prevailing wind. That is why [K] the isobars are elongated, except near the center where the force of the prevailing wind is of no account. The isobars could be circular only in a stationary typhoon. That is also why [L] typhoons move so as to keep the areas of high barometer on their right, and so as to recede from areas where the barometer is high, and so as to approach low-pressure areas. Most of the typhoons that originate in the Pacific to the east of the Philippines or Formosa move westward at first, then northwest, then north, then they recurve to the northeast, and beyond Japan they move eastward. This is under the influence of the high-pressure area in the northern Pacific, around which they [M] rotate in the same direction as the hands of a watch. When there are two typhoons about at the same time, they rotate round each other in the opposite direction, that is, abstracting from the influence of the high-pressure areas, which may cause them to move somewhat differently from this simple rule. In the China Sea there is sometimes a low-pressure channel between high pressures in China and in the southern part of the China Sea. A typhoon in the Pacific at such times is attracted toward the China Sea and passes along the low-pressure channel, because the winds blowing to either side of this channel agree with the winds round the center of a typhoon, and they move according to the principle of least action.

The preceding paragraphs suggest the following notes, each of which is lettered to correspond with the capitals inserted in the text:

[A] These troughs of low pressure are common over the northern temperate zone and, doubtless, occur also in the Southern Hemisphere. They have apparently much analogy to the great equatorial trough that extends almost continuously around the globe between the northeast and southeast trade winds of the two hemispheres. Another fine example is the long, narrow trough that frequently extends northward over the peninsula of California into Arizona. Such troughs are frequent over the United States and the adjacent Atlantic Ocean. If an axis extends east and west so that the areas of high pressure are north and south of it, then the barometric depression is slight but the contrasts of temperature are very great. If the axis of the trough trends northeast and southwest, then the depression is greater but the contrasts of temperature are less. In both cases a belt of cloud overlays the trough but the rainfall is light for the east-west troughs and only moderate for the northeast-southwest troughs. In the east-west trough, the principal portion of the area of cloud is on the southern side of the trough, but in the northeast-southwest troughs the principal cloudiness is on the west of the trough. The motions of the clouds indicate that in the east-west trough the surface winds which are often north and south rise over the trough and flow back on themselves quite symmetrically, which, perhaps, explains why the southerly wind after rising and overflowing produces heavier clouds and rain on the south side of the trough than does the northerly wind on the north side. In the northeast and southwest troughs the winds on the opposite sides, viz, the northerly wind on the west and the southerly wind on the east glide past each other with much less amount of overflow, so that the